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THE FUNGOUS FLORA OF ST. THOMAS

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(WITH PLATES 1–3)

During March of the present year the writer had the rare privilege of spending a week on the little island indicated by the title of the present paper in connection with the scientific survey which is being made of Porto Rico and the Virgin Islands by the New York Academy of Sciences. The mycological work which was assigned to the writer was conducted under the auspices of the New York Botanical Garden and the Department of Agriculture and Labor of Porto Rico, and to these institutions I am indebted for the opportunity of visiting these quaint and secluded little islands which have so recently become a part of our own country by purchase.

Leaving Porto Rico late in the evening of March 9 by the steamer "Marina," after a voyage which was calm, but which is likely to be rough more on account of the small size of the steamer than the severity of the wind, we arrived in the harbor of St. Thomas just as the day was beginning to dawn. The quiet town nestling in the foothills of the mountains, which rise quite abruptly from the shore, as seen from across the sheltered bay, with her ships peacefully at anchor, presented a picture not easily forgotten, and scarcely to be excelled in the beauty of its natural setting (See frontispiece). As the day advances, the hills, which by dim light appeared most luxuriant, are seen to be rather arid, which, while it may lessen their value agriculturally and botanically, detracts little from their natural beauty.

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The island, which is about thirteen miles long and three or four miles wide, is, for the most part, mountainous, the peaks of the hills rising to an elevation of 700–1,400 feet. There are no extended automobile roads, and many parts of the island can be reached only on foot or by horseback.

Like other tropical islands, the heat, which would otherwise be intense, is tempered by the everblowing trade winds. The daily variation is only about nine degrees, so that on the whole the temperature is not oppressive, and, by reason of the arid conditions, the climate is most healthful. The rainfall averages around forty-six inches per year, or approximately that of our own section (New York). This amount is scarcely sufficient for successful agriculture, considering the excessive evaporation resulting from the continuous heat and drying winds. The lay of the ground is also such that when it rains excessively, as it does at times, the water runs off quickly, leaving the hillsides parched and dry, and not particularly favorable for mycological work. Doubtless forestation of the hills, if it could be accomplished, would do much to retain the moisture and improve the island both agriculturally and botanically.

Unfortunately, the few remaining hills which are covered with large trees are being rapidly denuded. According to an old resident, within his memory valleys, or "guts" as they are called, which were wooded and abounding in fungi are now naked and dry. Whether the majority of the hills were ever heavily forested is a question, but, so far as we can judge from accounts, the island has never been agriculturally prosperous. Whether man can do for the island what nature has failed to do is difficult to say, but that conditions might be improved by artificial means can not be questioned.

It is an agreeable surprise for an American coming from Porto Rico and not familiar with Spanish to find English spoken exclusively in this island in spite of the fact that it had been under Danish rule for many years. This, together with the healthfulness of the climate, ought to make St. Thomas an attractive winter resort for those Americans who wish to escape the rigors of a northern climate and prefer quiet rest to the excitement of the average summer resort.

During our stay in the island we made our headquarters in St. Thomas, the only town on the island, reaching into the outlying districts, using "autos" where possible and when otherwise using horses or tramping. March 10 was spent near the town, or as far west as Mosquito Bay. One day (March 11) was spent on or near the Louisenhöj estate, belonging to Mr. Arthur Fairchild, and located in the hills above the town at an elevation of 800 feet, our collecting reaching from here down the opposite side of the island to Bucks Bay. March 12 was spent along the shore as far west as John Bruce Bay, and the following day in the vicinity of Mandal in the opposite direction.

The longest trip made was from St. Thomas to Botany Bay at the extreme western end of the island. This expedition was made in company with Prof. Kemp of Columbia University, the purposes being mainly geological. The horses for this outing were furnished by Mr. Axel Holst, whose "week-end" cottage on Botany Bay was opened to us on this occasion. The mycological work at this point was not very satisfactory, although the trip itself was most delightful, and some of the mountain regions through which we passed looked promising had we had time to stop.

The most fruitful day on the island, from a mycological point of view, was March 16, which was spent on the mountain range west of Louisenhöj in the ravine known as St. Peter's "gut" and in its general vicinity. Mr. Adolph Sixto, an enthusiastic naturalist and loyal resident, acted as guide. Although the collecting was very favorable, he repeatedly assured the writer that, owing to recent destruction of the forests, conditions were not what they once were.

While several papers have been published on the fungi of St. Thomas and the other American Virgin Islands, the work has been done mostly by Europeans, so far as known no American mycologist having previously visited the islands. The most complete and recent record is that of C. Ferdinandsen and Ø. Winge.[1] In this paper reference is made to other lists previously published, including those of E. Fries[2] and Borgensen and Paulsen.[3] Since so

[1] C. Raunkiaer, Fungi from the Danish West Indies collected 1905–1906, Part 1.—Bot. Tidssk. 29: 1–25. 1908.

[2] E. Fries, Novae Symbolae Mycologicae (various pages).

little is known of the fungi of the Virgin Islands, especially St. Thomas, it is thought worth while to summarize our knowledge of the larger islands separately, the present paper being concerned with St. Thomas. The species reported for the first time are indicated in **bold-face type.** Starred (*) species are those re-collected. The writer is indebted to Dr. W. A. Murrill for determination of the most of the basidiomycetes collected, as well as for comments on those previously reported. The rusts were determined by Dr. J. C. Arthur, and the one slime mould by Professor T. H. Macbride.

SUMMARY OF THE WORK

One hundred and nine species of fungi are here recorded for St. Thomas (excluding the doubtful records), fifty-four of which were collected for the first time during our stay of one week in the island. Of these, seven are described as new. Of the fifty-five species based on previous records, only fourteen were re-collected by us. The small amount of duplication would suggest a rather extensive fungous flora, in spite of the arid conditions prevailing there.

MYXOMYCETES

Stemonitis splendens Rost. Sluz. Monog. 195. 1875.
On rotten wood. Collected in the vicinity of St. Peter.
Macbride (in litt.) considers this the true *S. splendens* originally described by Rostafinski from tropical material collected in the northern part of South America. North American plants described as *Stemonitis Morgani* by Peck, and later made a synonym of the above, Macbride still thinks are distinct from the tropical form.

PERONOSPORALES

Albugo platensis (Speg.) Swing. Jour. Myc. **7**: 113. 1892.
Cytospora platensis Speg. Rev. Argent. Hist. Nat. **1**: 32. 1891.
On *Boerhaavea erecta* L. Collected near Mandal.

PERISPORIALES

MELIOLA ASTERINOIDES Winter, Hedwigia **25**: 96. 1886.
Reported by Ferdinandsen & Winge on *Piper peltatum* L.
An immature specimen of what appeared to be a *Capnodium* was also reported by Ferdinandsen & Winge on *Mangifera indica* L.

[3] F. Børgesen and O. Paulsen. Om Vegetationen paa de dansk-vestindiske Øer. Bot. Tidssk. **22**: 111–113. 1898.

DOTHIDEALES

Catacuma palmicola Stevens, Bot. Gaz. **69**: 251. 1920.
On *Coccothrinax argentea* (Lodd.) Sargent. Collected in hills near St. Thomas.

Phyllachora Crotonis (Cooke) Sacc. Syll. Fung. **2**: 599. 1883.
Dothidea Crotonis Cooke, Grevillea **10**: 129. 1882.
On living leaves of *Croton Astroites* Dryand. Collected in hills near St. Thomas. The spores of our specimens are rather larger than indicated for this species, being about 10 x 20 μ. However, it is thought best to refer these plants to the above name.

* PHYLLACHORA GRAMINIS (Pers.) Fuckel, Symb. Myc. 216. 1869.
Sphaeria graminis Pers. Obs. Myc. **1**: 18. 1796.
On various grasses. Reported from St. Thomas.

Phyllachora Nectandrae Stevens & Dalby, Bot. Gaz. **68**: 57. 1919.
On *Nectandra coriacea* (Sw.) Griseb. Collected in hills near St. Thomas.

? **Phyllachora serjaniicola** Chardon, Mycologia **13**: 293. 1921.
On *Serjania polyphylla* Radlk. Collected in hills near St. Thomas. Specimens do not show spores, but spots seem characteristic.

HYPOCREALES

Chromocreopsis bicolor (Ellis & Ev.) Seaver, Mycologia **2**: 64. 1910.
Hypocrea bicolor Ellis & Ev. Jour. Myc. **4**: 58. 1888.
On decaying wood. Collected near St. Thomas.

CREONECTRIA GRAMMICOSPORA (Ferd. & Winge) Seaver, Mycologia **1**: 192. 1909.
Nectria grammicospora Ferd. & Winge, Bot. Tidssk. **29**: 11. 1908.
On dead branches. Reported from the island of St. Thomas.

CREONECTRIA OCHROLEUCA (Schw.) Seaver, Mycologia **1**: 190. 1909.
Sphaeria ochroleuca Schw. Trans. Am. Phil. Soc. II. **4**: 204. 1832.
Reported from St. Thomas under the name of *Nectria vulgaris* Speg., which is now regarded as a synonym of the above.

Hypomyces rosellus (Alb. & Schw.) Tul. Ann. Sci. Nat. IV. **13**: 12. 1860.
Sphaeria rosella Alb. & Schw. Consp. Fung. 35. 1805.
On *Auricularia nigrescens* (Sw.) Farl. Collected in the vicinity of St. Peter.

Nectria episphaeria (Tode) Fries, Summa Veg. Scand. 388. 1849.
Sphaeria episphaeria Tode, Fungi Meckl. **2**: 21. 1791.
On old fungi. Collected in the vicinity of St. Peter.

NECTRIA SUFFULTA Berk. & Curt.; Berk. Jour. Linn. Soc. **10**: 378. 1868.
On dead *Musa*. Reported from St. Thomas under the name of *Nectria setosa* Ferd. & Winge, which is now regarded as a synonym of the above.

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STILBOCREA HYPOCREOIDES (Kalchbr. & Cooke) Seaver, Mycologia **2**: 62. 1910.
Sphaerostilbe hypocreoides Kalchbr. & Cooke, Grevillea **9**: 26. 1880.
On bark of trees. Described as new from St. Thomas under the name of *Sphaerostilbe intermedia* Ferd. & Winge, which is now regarded as a synonym of the above.

FIMETARIALES

Pleurage arachnoidea (Niessl) Griff. Mem. Torrey Club **11**: 73. 1902.
Podospora arachnoidea Niessl; Krieger, Fung. Sax. exsicc. *371*; Hedwigia **35**: (143). 1896.
On cow dung. Collected near St. Thomas.

SPORORMIA INTERMEDIA Auersw. Hedwigia **7**: 67. 1868.
On donkey dung. Reported from Lövenlund.

SPHAERIALES

* DALDINIA CONCENTRICA (Bolt.) Ces. & DeNot. Comm. Critt. Ital. **1**: 198. 1863.
Sphaeria concentrica Bolton, Fungi Halifax **3**: 180. 1791.
On dead wood. Collected near Louisenhöj.

* DALDINIA ESCHSCHOLZII (Ehrenb.) Rehm, Ann. Myc. **2**: 175. 1904.
Sphaeria Eschscholzii Ehrenb. Horae Physicae 89. 1820.
On dead wood. Common.
Perhaps only a large form of the preceding.

EUTYPA AURANTIICOLA Speg. Anal. Soc. Ci. Arg. **26**: 26. 1888.
On stumps of wood. Reported from Crown.

Eutypa flavovirescens (Hoffm.) Sacc. Syll. Fung. **1**: 172. 1882.
Sphaeria flavovirescens Hoffm. Veg. Crypt. **1**: 10. 1787.
Eutypa flavovirens Tul. Fung. Carp. **2**: 57. 1863.
On old wood. Collected near St. Thomas.

Guignardia pipericola Stevens, Trans. Ill. Acad. Sci. **10**: 183. 1917.
One specimen in the herbarium of The New York Botanical Garden was collected by E. G. Britton and Delia W. Marble on *Piper medium* Jacq., east of Charlotte Amalia.

Hypoxylon annulatum (Schw.) Mont. in C. Gay, Hist. Chil. Bot. **7**: 445. 1854.
Sphaeria annulata Schw. Jour. Acad. Sci. Phila. **5**: 11. 1825.
On old wood. Collected near Mandal and John Bruce Bay.

HYPOXYLON PSEUDOPACHYLOMA Speg. Bol. Acad. Ci. Cordoba **11**: 206. 1887.
On dead branches. Reported from near St. Thomas.

* HYPOXYLON RUBIGINOSUM (Pers.) Fries, Summa Veg. Scand. 384. 1849.
Sphaeria rubiginosa Pers. Syn. Fung. 11. 1801.
On dead wood. Collected in hills near St. Peter.

Lizonia Jacquiniae Bri. & Har. Rev. Myc. **13**: 16. 1891.
On *Jacquinia Barbasco* (Loefl.) Mez. Collected near St. Thomas.
While no authentic specimens of this species have been seen, our plants seem to conform well with the original description.

NUMMULARIA GLYCYRRHIZA (Berk. & Curt.) Sacc. Syll. Fung. **1**: 401. 1882.
Hypoxylon Glycyrrhiza Berk. & Curt. Jour. Acad. Nat. Sci. Phila. II. **2**: 285. 1853.
On old wood. Collected near St. Thomas.

Nummularia repanda (Fries) Nitsch. Pyrenom. Germ. 57. 1867.
Sphaeria repanda Fries, Obs. Myc. **1**: 168. 1815.
On dead wood. Collected in the vicinity of St. Peter and in St. Thomas.

NUMMULARIA DURA Ferd. & Winge, Bot. Tidssk. **29**: 15. 1908.
On bark of trees. Reported from Lövenlund.

Otthia hypoxyloides Ellis & Ev. N. Am. Pyrenom. 249. 1892.
Amphisphaeria Hypoxylon Ellis & Ev. Jour. Myc. **2**: 41. 1886.
On old branches. Collected in St. Thomas.

Physalospora Andirae Stevens, Trans. Ill. Acad. Sci. **10**: 184. 1917.
On *Andira inermis* H.B.K. [*Andira jamaicensis* (W. Wr.) Urb.]. Collected near Bucks Bay.

Rosellinia Bresadolae Theiss. Ann. Myc. **6**: 351. 1908.
On decorticated branches. Collected in the vicinity of St. Peter.
Characterized by its conical perithecia, and fusiform and flattened spores. The specimen seems to agree with the description of the above based on material collected in Brazil, although no mention is made of the flattened spores in that species.

Rosellinia melaleuca Ellis & Ev. Bull. Lab. Nat. Hist. State Univ. Iowa **2**: 402. 1893.
On wood. Collected near St. Thomas.

Rosellinia subiculata (Schw.) Sacc. Syll. Fung. **1**: 255. 1882.
Sphaeria subiculata Schw. Nat. Ges. Leipzig **1**: 44. 1822.
On old wood. Collected in the vicinity of St. Peter.

Ustulina vulgaris Tul. Fung. Carp. **2**: 23. 1863.
On dead wood. Collected in the vicinity of St. Peter.

Xylaria appendiculata Ferd. & Winge, Bot. Tidssk. **29**: 17. 1908.
On dead leaf. Collected in the hills near St. Thomas.
Material collected by the writer agrees with the original description of the above species in presenting both the *Hypoxylon* and *Xylaria* type of stroma on the same substratum. These were at first thought to be different species, but were later found to, apparently, be different forms of the same plant.

Xylaria Hypoxylon (L.) Grev. Fl. Edin. 355. 1824.
Clavaria Hypoxylon L. Fl. Suecica ed. II. 457. 1755.
On wood. Collected near St. Thomas and in the vicinity of St. Peter.

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* XYLARIA SESSILIS Ferd. & Winge, Bot. Tidssk. **29**: 18. 1908.
On wood. Collected near St. Thomas.

Xylaria subtorulosa Speg. Bol. Acad. Nac. Ci. **11**: —137. 1889.
On wood. Reported from St. Thomas and Crown.

PEZIZALES

ASCOPHANUS CARNEUS (Pers.) Boud. Ann. Sci. Nat. V. **10**: 250. 1869.
Ascobolus carneus Pers. Syn. Fung. 676. 1801.
On donkey dung. Reported from St. Thomas.

Bactrospora integrispora sp. nov.
Apothecia scarcely more than one half mm. in diameter, black, disc-shaped, usually with a slightly elevated margin, thickly scattered over the surface of the substratum; asci subcylindric with an abruptly attenuated base and short stem, about 70 x 10 μ; spores cylindric, 7–8-septate (septa often indistinct), 50 x 2–2.5 μ, not breaking into segments in the ascus.
On decorticated surface of some unidentified tropical wood.
Type collected March 10, 1923, near St. Thomas.

Dermatea dimorpha sp. nov.
Pycnidial stage consisting of club-shaped or flask-shaped bodies 1–2 mm. high, either occurring separately or associated with and often fused to the base of the apothecia; pycnidia more or less angular, about 2 μ in diameter; apothecia usually cespitose, sessile or substipitate, shallow-cup-shaped, with a purplish tint, the hymenium slightly darker, reaching a diameter of 1–2 mm.; asci clavate, about 40 x 4 μ; spores usually 1-seriate, ellipsoid, often with two small oil drops, 2 x 4 μ.
On dead branches of some undetermined shrub or vine; also on dead wood of some tree.
Type collected March 11, 1923, at the estate, Louisenhöj.

Niptera subiculata sp. nov.
Apothecia gregarious, sessile, saucer-shaped, externally whitish; hymenium pale-yellow, reaching a diameter of about 1 mm.; asci 8-spored, 60–75 x 6 μ; spores 1-seriate or slightly crowded, ellipsoid, 1-septate, 8–10 x 2–2.5 μ.
On a black subiculum on a rotten stick, accompanying *Rosellinia subiculata* (Schw.) Sacc. Collected in the vicinity of St. Peter.

Patellaria atrata (Hedw.) Fries, Syst. Orbis Veg. 113. 1825.
Lichen atratus Hedw. Laub. Moose **2**: 73. 1789.
On old wood, near St. Thomas.

In addition to the species of cup fungi listed, spores of a *Saccobolus* and a species of *Lasiobolus* were found on dung. Neither species could be determined with certainty, and both were too fragmentary to justify ascribing names to them.

HYSTERIALES

Gloniopsis guttulata sp. nov.

Apothecia in clusters on the substratum, usually parallel, straight or very slightly curved, reaching a length of 1 mm.; asci clavate, 8-spored; spores ellipsoid or ovoid, thickly crowded with large guttulae, which apparently mark the spaces between the septa, giving the spore a muriform structure, about 14 x 7 μ, hyaline.

On the decorticated surface of some tropical wood. Collected near St. Thomas.

Hysterium Calabash sp. nov.

Apothecia gregarious in little clusters on the substratum, straight or curved, reaching a length of 1 mm.; asci clavate, reaching a length of 70 μ and a diameter of 10 μ, 8-spored; spores fusoid, 3-septate, slightly constricted at the septa, pale-brown, about 18 x 8 μ.

On the surface of dried calabash fruit. Collected near St. Thomas.

PHACIDIALES

Tryblidium rufulum (Spreng.) Ellis & Ev. N. Am. Pyrenom. 690. 1892.
Hysterium rufulum Spreng. Vet. Akad. Handl. **1820**: 50. 1820.
On dead sticks. Common.

FUNGI IMPERFECTI

PHYLLOSTICTALES

DARLUCA FILUM (Biv.) Sacc. Syll. Fung. **3**: 410. 1884.
Sphaeria Filum Biv.-Bern. Stup. Rar. Manip. **3**: 12. 1815.
On *Puccinia Synedrellae* P. Henn. Reported from Lövenlund.

MELOPHIA EUGENIAE Ferd. & Winge, Bot. Tidssk. **29**: 20. 1908.
On living leaves of *Eugenia* sp. Reported from Lövenlund.

Phoma lathyrina Sacc. Michelia **2**: 274. 1881.
On pods of *Albizzia Lebbeck* (L.) Benth. Collected in the vicinity of St. Peter.

Phoma Leonotidis sp. nov.

Pycnidia thickly scattered over the substratum, immersed, small, reaching a diameter of 100–125 μ; spores minute, ellipsoid, about 2–3 x 4–6 μ, hyaline, usually containing two small oil-drops.

On dead stems of *Leonotis nepetaefolia* (L.) R. Br.

HYPHOMYCETES

Didymaria Solani sp. nov.

Forming rusty-brown spots on the substratum, 3–5 mm. in diameter, visible on both sides of the leaf, but producing fruit on the under side only (so far as observed); sporophores forming sori almost entirely covering the infected area, comparatively short, and reaching a diameter of 6 μ, sparingly branched; spores at first globose, elon-

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gating, and finally becoming ellipsoid to cylindric, 1-septate, reaching a length of 20 μ and a diameter of 8 μ.
On living leaves of *Solanum* sp. Collected near Mandal.

FUMAGO VAGANS Pers. Myc. Eu. 1: 9. 1822.
On leaves of *Piper medium* Jacq. and *Mangifera indica* L. Reported from St. Thomas.

HETEROSPORIUM REPANDUM Ferd. & Winge, Bot. Tidssk. 29: 23. 1908.
On dry branches. Reported from Lövenlund.

OIDIUM CYPARISSIAE Syd. Hedwigia 36: (163). 1879.
On *Euphorbia* sp. Reported from Lövenlund.

PUCCINIOPSIS CARICAE (Speg.) Seaver comb. nov.
Cercospora? Caricae Speg. Ann. Soc. Ci. Argent. 22: 215. 1886.
Pucciniopsis Caricae Earle, Bull. N. Y. Bot. Garden 2: 340. 1902.
On decaying leaves of *Carica Papaya* L. Reported from St. Thomas and Lövenlund.

STILBUM HEVEAE (A. Zimm.) Sacc. & P. Sacc. Bull. Inst. Buitz. 10: 21. 1901.
Stilbella Heveae Zimm.; P. Henn. Hedwigia 41: 148. 1902.
On stumps of wood. Reported from St. Thomas.

STILBUM KARSTENII Sacc. Syll. Fung. 10: 682. 1892.
Associated with *Sphaerostilbe intermedia* Ferd. & Winge. Reported from St. Thomas.

TUBERCULINA PERSICINA (Ditm.) Sacc. Fungi Ital. *f. 964.*
Tubercularia persicina Ditm. in Sturm. Deuts. Fl. Pilze 1: 99. 1817.
On *Puccinia Raunkiaerii* Ferd. & Winge. Reported from St. Thomas.

STERILE MYCELIUM

SCLEROTIUM VULGATUM Fries, Obs. Myc. 1: 204. 1815.
On human excrement. Reported from St. Thomas.

USTILAGINALES

USTILAGO FIMBRISTYLIS Thüm. Bull. Torrey Club 6: 95. 1876.
On *Fimbristylis diphylla* (Retz.) Vahl. Reported from Crown.

UREDINALES

AECIDIUM CIRCUMSCRIPTUM Schw.; Berk. & Curt. Jour. Phila. Acad. Sci. 2: 283. 1853.
Aecidium Cissi Wint. Hedwigia 23: 168. 1884.
On *Cissus sicyoides* L. Reported from Crown and Lövenlund.

PUCCINIA BLECHI Lagerh. Bull. Soc. Myc. Fr. 11: 214. 1895.
On *Blechum Brownei* Juss. Reported from Lövenlund.

PUCCINIA CRASSIPES Berk. & Curt.; Berk. Grevillea 3: 54. 1874.
On *Ipomoea* sp. Reported from Lövenlund under the name of *Puccinia Ipomoeae panduranae* (Schw.) Syd.

Puccinia esclavensis Diet. & Holw.; Holway, Bot. Gaz. **24**: 29. 1897.
On *Valota insularis* (L.) Chase. Collected near St. Peter.
Species new to the West Indies, although common on the continent.

PUCCINIA HETEROSPORA Berk. & Curt. Jour. Linn. Soc. **10**: 356. 1869.
On *Sida* sp. Reported from Lövenlund.

Puccinia Hyptidis (M. A. Curt.) Tracy & Earle, Bull. Miss. Exp. Sta. **34**: 86. 1895.
Uredo Hyptidis Curt. Am. Jour. Sci. II. **6**: 353. 1848.
On *Hyptis capitata Jacq.* Collected in the vicinity of St. Peter.

Puccinia impedita Mains & Holw.; Arth. Mycologia **10**: 135. 1918.
On *Salvia coccinea* Juss. Collected near St. Thomas.

Puccinia invaginata Arth. & Johnst. Mem. Torrey Club **17**: 146. 1918.
On *Gouania polygama* (Jacq.) Urban. Collected near St. Thomas.

* PUCCINIA LANTANAE Farl. Proc. Amer. Acad. Sci. **18**: 83. 1883.
On *Lantana camara* L.? Collected in the vicinity of St. Peter. Also collected by Dr. J. N. Rose.

* PUCCINIA LEONOTIDIS (P. Henn.) Arth. Mycologia **7**: 245. 1915.
Uredo Leonotidis P. Henn. in Engler Pfl. Ost.-Afr. **C**: 52. 1895.
On *Leonotis nepetaefolia* (L.) R. Br. Reported from Lövenlund under the name of *Puccinia leonotidicola* P. Henn. Also collected at Mandal.

PUCCINIA MACROPODA Speg. An. Soc. Ci. Arg. **10**: 8. 1880.
On *Iresine elatior* L. C. Rich. Reported from Lövenlund.

* PUCCINIA OBLIQUA Berk. & Curt. Jour. Linn. Soc. **10**: 356. 1858.
On *Metastalma* sp. Collected near St. Thomas. Also reported by Dr. Arthur, Mycologia **7**: 242.

PUCCINIA OPULENTA Speg. Fung. Arg. **1**: No. 36. 1880.
On Convolvulaceae. Collected by Dr. J. N. Rose.

PUCCINIA RAUNKIAERII Ferd. & Winge, Bot. Tidssk. **29**: 8. 1908.
On petioles and leaves of *Rivina humulis* L. Described from St. Thomas.

Puccinia Scleriae (Paz.) Arth. Mycologia **9**: 75. 1917.
Rostrupia Scleriae Paz. Hedwigia **31**: 96. 1892.
On *Scleria pterota* Presl. Collected in the vicinity of St. Peter.

PUCCINIA SYNEDRELLAE P. Henn. Hedwigia **37**: 277. 1898.
On *Synedrella nodiflora* (L.) Gaertn. Reported from Lövenlund.

PUCCINIA URBANIANA P. Henn. Hedwigia **37**: 278. 1898.
On *Stachytarpheta* sp. Reported from Crown.

PUCCINIOSIRA PALLIDULA (Speg.) Lagerh. Tromsø. Mus. Aarsh. **16**: 122. 1894.
Coleosporium (?) *pallidulum* Speg. Anal. Soc. Ci. Argent. **17**: 95. 1884.
On *Triumfetta* sp. Reported from St. Thomas under the name of *Pucciniosira Triumphettae* Lgh.

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Ravenelia Stevensii Arth. Mycologia **7**: 178. 1915.
On *Acacia riparia* H.B.K. Collected near St. Thomas.

UREDO COMMELINAE Speg. Anal. Soc. Ci. Argent. **9**: 172. 1880.
On *Commelina* sp. Reported from Lövenlund.

Uromyces Caesalpiniae Arth. Mycologia **7**: 183. 1915.
Ravenellia Caesalpiniae Arth. Bull. Torrey Club **31**: 5. 1904.
On *Mimosa ceratonia* L. Collected in the vicinity of St. Peter.

Uromyces Dolicholi Arth. Bull. Torrey Club **33**: 27. 1906.
On *Dolicholus reticulatus* (Sw.) Millsp. Collected near St. Peter.
Cajan Cajan (L.) Millsp. Collected near St. Peter.

Uromyces gemmatus Berk. & Curt.; Berk. Jour. Linn. Soc. **10**: 357. 1869.
On *Jacquemontia nodiflora* (Desv.) G. Don. Collected near St. Thomas.

AURICULARIALES

Auricularia nigrescens (Sw.) Farl. Bib. Index **1**: 308. 1905.
Peziza nigrescens Sw. Prodr. 150. 1799.
On wood. Collected in St. Peter's Gut.

AGARICALES

COPRINUS ARMILLARIS Fries, Nova Acta Soc. Sci. Upsal. III. **1**: 28. 1855.
Known only from St. Thomas.

* COPRINUS EPHEMERUS Pers. Syn. Fung. 406. 1801.
On dung. Reported from St. Thomas by Fries. Also specimens grown in culture on dung from St. Thomas appear to conform to the requirements of this species.

COLTRICIA CINNAMOMEA (Jacq.) Murrill, Bull. Torrey Club **31**: 343. 1904.
Boletus cinnamomeus Jacq. Coll. **1**: 116. 1786.
Reported by Børgesen and Paulsen under the name of *Polyporus oblectans* Berk., which is now regarded as a synonym of the above.

CORIOLUS NIGROMARGINATUS (Schw.) Murrill, Bull. Torrey Club **32**: 649. 1906.
Boletus nigromarginatus Schw. Schr. Nat. Ges. Leipzig **1**: 98. 1822.
Reported by Børgesen and Paulsen l.c. under the name of *Polyporus hirtellus*, which is now regarded as a synonym of the above.

Coriolus pavonius (Hook.) Murrill, N. Am. Fl. **9**: 25. 1907.
Boletus pavonius Hook. in Kunth. Syn. Pl. **1**: 10. 1822.
On wood. Collected near St. Thomas.

* CORIOLUS PINSITUS (Fries) Pat. Tax. Hymén. 94. 1900.
Polyporus pinsitus Fries, Elench. Fung. 95. 1888.
On stick. Collected near St. Thomas.

Coriolopsis rigida (Berk. & Mont.) Murrill, N. Am. Fl. **9**: 75. 1908.
Trametes rigida Berk. & Mont. Ann. Sci. Nat. III. **11**: 240. 1849.
On wood. Collected in hills near St. Thomas.

Elfvingiella fasciata (Sw.) Murrill, Trop. Poly. 90. 1915.
Boletus fasciatus Sw. Prodr. 149. 1788.
On wood. Collected in the vicinity of St. Peter.

Favolus Rhipidium Berk. in Hooker's Jour. Bot. **6**: 319. 1847.
On wood. Collected in the vicinity of St. Peter.

Gloeophyllum striatum (Sw.) Murrill, Bull. Torrey Club **32**: 370. 1905.
Agaricus striatus Sw. Prodr. 148. 1788.
On wood. Collected near John Bruce Bay.

GALERULA MACROMASTES (Fries) Murrill, N. Am. Fl. **10**: 169. 1917.
Agaricus macromastes Fries, Nova Acta Soc. Sci. Upsal. III. **1**: 226. 1855.
Known only from St. Thomas.

Hapalopilus gilvus (Schw.) Murrill, Bull. Torrey Club **31**: 418. 1904.
Boletus gilvus Schw. Schr. Nat. Ges. Leipzig **1**: 96. 1822.
On wood. Collected in the vicinity of St. Peter.

* LENTINUS CRINITUS (L.) Fries, Syst. Orbis. Veg. 77. 1825.
Agaricus crinitus L. Sp. Pl. ed. 2. 1644. 1763.
On wood. Collected in the vicinity of St. Peter.
Panus Troglodytes Fries, described from St. Thomas, is thought by Murrill to be close to the above species.

* LENTINUS HIRTUS (Fries) Murrill, Mycologia **3**: 29. 1911.
Agaricus hirtus Fries, Linnaea **5**: 508. 1830.
On wood. Collected near St. Thomas.
Lentinus flaccidus Fries, described from St. Thomas, is thought by Murrill to be a form of *L. hirtus*.

Lentinus velutinus Fries, Linnaea **5**: 510. 1830.
On wood. Collected near Mandal.

MELANOLEUCA DICHROPUS (Fries) Murrill, Mycologia **3**: 193. 1911.
Agaricus dichropus Fries, Nova Acta Soc. Sci. Upsal. III. **1**: 22. 1855.
Known only from St. Thomas.

NAUCORIA PAPULARIS (Fries) Sacc. Syll. Fung. **5**: 856. 1887.
Agaricus papularis Fries, Nova Acta Soc. Sci. Upsal. III. **1**: 225. 1855.
Known only from St. Thomas.

Pogonomyces hydnoides (Sw.) Murrill, Bull. Torrey Club **31**: 609. 1904.
Boletus hydnoides Sw. Prodr. 149. 1788.
On wood. Collected in several localities near St. Thomas.

Polyporus subelegans Murrill, N. Am. Fl. **9**: 62. 1907.
On wood. Collected in the vicinity of St. Peter.

* PYCNOPORUS SANGUINEUS (L.) Murrill, Bull. Torrey Club **31**: 421. 1904.
Boletus sanguineus L. Sp. Pl. ed. 2. 1646. 1763.
On wood. Collected in the vicinity of St. Thomas.

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PILOSACE TRICHOLEPIS (Fries) Sacc. Syll. Fung. **5**: 1010. 1887.
Agaricus tricholepis Fries, Nova Acta Soc. Sci. Upsal. III. **1**: 25. 1855.
Said by Fries to have been collected in St. Thomas, but Oersted's drawing (according to Murrill) bears the name St. Croix.

* SCHIZOPHYLLUM ALNEUM (L.) Schroet. Krypt.-Fl. Schles. **3**: 553. 1889.
Agaricus alneus L. Sp. Pl. ed. 2. 1644. 1763.
On sticks. Collected near St. Thomas.
Previously reported under the names *Schizophyllum commune* and *Schizophyllum multifidum*, both of which are regarded as synonyms of the above.

LYCOPERDALES

Cyathus triplex Lloyd, The Nidulariaceae 23. 1906.
On sticks. Collected in the vicinity of St. Peter.

Geaster Hariotii Lloyd, Myc. Notes **25**: 311. 1907.
On soil in woods. Collected in St. Peter's Gut.
A beautiful species, with sulcate mouth. Determined by Dr. W. C. Coker.

DOUBTFUL SPECIES REPORTED BY BØRGESEN AND PAULSEN

Polyporus lucidus (Leys.) Fries. Probably some species of *Ganoderma*, but not *lucidus*.

Polyporus velutinus Fries. Probably some species of *Coriolus*, but not *velutinus*.

Polyporus incrustatus Fries. This is a doubtful species of *Ganoderma* originally reported from Costa Rica.

Polyporus fornicatus Fries. Some species of *Ganoderma*, but not *fornicatus*.

DOUBTFUL SPECIES REPORTED BY FRIES

Lentinus cochleatus Fries. This is now regarded as a synonym of *Lentinellus cornucopioides* (Bolt.) Murrill, which is not thought to occur in St. Thomas.

Panaeolus phalenarum (Fries) Quél. Murrill thinks this has been confused with *Campanularius solidipes* (Peck) Murrill, which occurs in St. Thomas.

NEW YORK BOTANICAL GARDEN

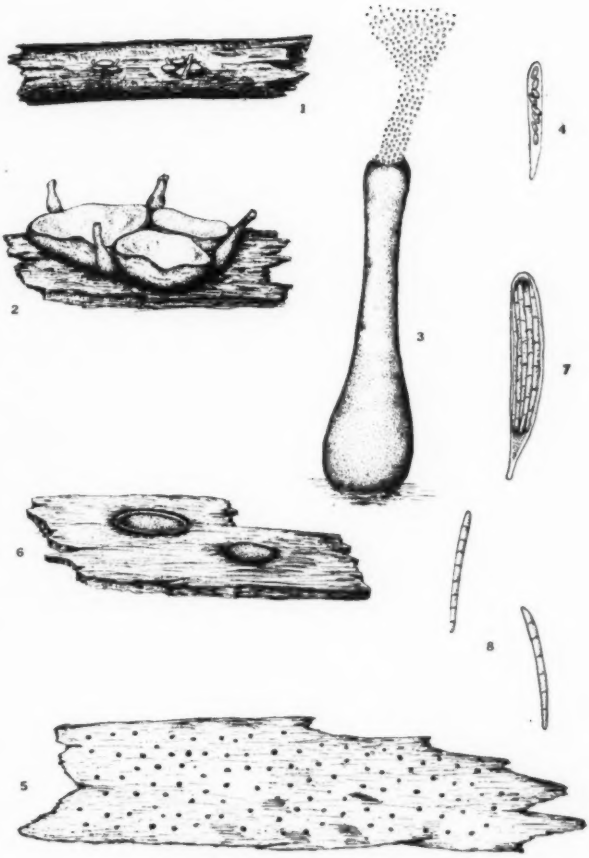
EXPLANATION OF PLATES

PLATE 1 (Frontispiece)

Island and town of St. Thomas from across the harbor.

PLATE 2

Figs. 1–4. *Dermatea dimorpha*. 1, habitat, about natural size; 2, apothecia and pycnidia enlarged; 3, a single pycnidium and pycnospores much enlarged; 4, ascus with spores, drawn with the aid of the camera lucida.



1–4. DERMATEA DIMORPHA Seaver
5–8. BACTROSPORA INTEGRISPORA Seaver

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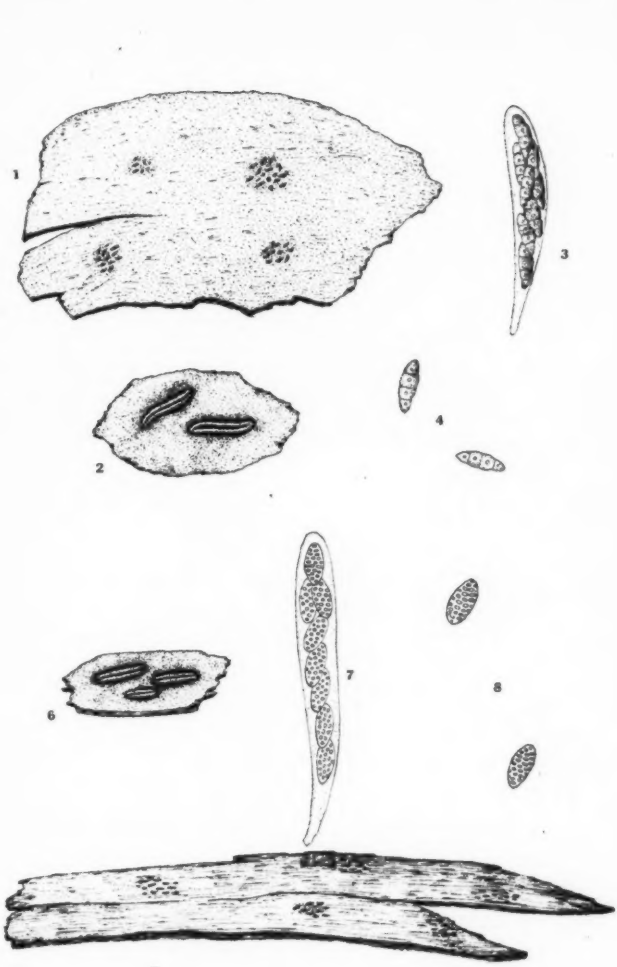

1–4. HYSTERIUM CALABASH Seaver
5–8. GLONIOPSIS GUTTULATA Seaver

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Figs. 5–8. *Bactrospora integrispora.* 5, habitat, about natural size; 6, two plants enlarged; 7, 8, ascus and spores, drawn with the aid of the camera lucida.

PLATE 3

Figs. 1–4. *Hysterium Calabash.* 1, habitat, about natural size; 2, two plants enlarged; 3, 4, ascus and spores, drawn with the aid of the camera lucida.

Figs. 5–8. *Gloniopsis guttulata.* 5, habitat, about natural size; 6, three plants enlarged; 7, 8, asci and spores, drawn with the aid of the camera lucida.

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NOTES ON SPECIES OF RUSSULA

GERTRUDE S. BURLINGHAM

(WITH PLATES 4 AND 5)

During August, 1920, it was my good fortune to be invited to spend two weeks collecting at Indian Point, Magnetawan, Canada, the summer home of Dr. Howard A. Kelly. For the most part the species of *Russula* found were the same as found in the vicinity of Newfane, Vermont. *Russula lepida* Fr., however, was more common, and I found one undescribed species which I am pleased to name in honor of Doctor Kelly because of his active interest in mycology. Specimens of the species of *Russula* and *Lactaria* which I collected at Indian Point and vicinity are preserved in Dr. Kelly's herbarium and some duplicates are in my own herbarium.

When Dr. Peck described *Russula ventricosipes* from material sent him by Mr. Simon Davis he did not include the spore color or the taste. Miss Ann Hibbard has collected the species twice on Cape Cod, and in her notes on the specimens collected at North Eastham on October 15, 1920, the taste is given as mild and the spores described as deep cream-white in mass (fleshy-white, t. 4). In examining the spores I found them to be practically smooth as far as one could determine with an oil immersion lens and much longer in proportion to width than is usual with the *Russula* spores. But on examination of spores from the type, I found them identical with the spores from Miss Hibbard's specimens. The size varies from 5–6.25 μ x 8–10 μ.

Mr. Simon Davis has spent part of several summers in Wyoming and has sent me some excellent collections of both *Russulae* and *Lactariae* from that region. I shall reserve these for a special article on Wyoming species except for the one *Russula* which is described here.

The vicinity surrounding Newfane, Vermont, seems to abound with species of *Russula*. Although I have been collecting in the Newfane Hill region since 1914, I can find each summer a few

species which I have not seen before. The early spring in 1921 brought out in August species which usually do not appear until September and which possibly in short seasons do not appear at all. *Russula dura* was found in a spot where I have collected for seven years. On the other hand, *Russula secreta* has been found in small quantities since 1914, but not until 1920 did I find it in sufficient quantities to determine definitely the taste and spore color. In August, 1921, I found another solitary specimen of *Russula redolens* perhaps 1,000 feet distant from the type locality.

In Montgomery, Alabama, Dr. R. P. Burke is doing extensive collecting. Among specimens which he has sent me is *Russula Davisii*, described originally from Massachusetts, and *Russula magnifica* Peck, which have not been previously reported from the state. Three of the species seem to be undescribed. Dr. Burke has water-color sketches of these, and the type specimens are divided between my herbarium and the New York Botanical Garden herbarium.

Russula Kellyi sp. nov.

Pileus broadly convex, becoming expanded, up to 11 cm. broad; surface varying from chamois (325, t. 1–4) and brown pink (297), paler toward the margin, glabrous, very viscid when wet, pellicle separable half way to the center, margin striate-tuberculate; context peppery, without special odor; lamellae almost white, equal, a few forking next stipe, interveined, rounded at the outer end, narrowed then rounded at the inner end, broad, subclose; stipe white, not changing color when fresh, but slightly gray when dried, firm, stuffed, glabrous, 8 cm. long by 1.8 to 2 cm. thick, slightly ventricose; spores maize-yellow, tone 3, ellipsoid, echinulate, apiculate and unsymmetrical, 6.25 x 7.5 μ.

TYPE LOCALITY: Indian Point, Magnetawan, Canada, August 21, 1920.

HABITAT: On ground by decayed wood, in mixed pine and oak woods.

In dry weather the pileus is shining as though varnished, while in wet weather it is covered with a thick layer of viscidity. The color of a specimen collected in dry weather was brownish-terra-cotta (322, t. 1–2) on the outer portion and blood-red-brown in the center (337). From *Russula aurantialutea* Kauff. it may be

distinguished by the pale-gray color of the stipe when dried, and by the absence of any bright-yellow or orange color in the pileus of the fresh plant. In dried specimens there is also a slight-gray color seen in the depths of the lamellae. The spores are paler than those of *Russula aurantialutea.*

Russula alcalinicola sp. nov.

Pileus becoming expanded, umbilicate, up to 10 cm. broad; surface white, glabrous, viscid when wet, with pellicle separable part way to the center, margin wavy, substriatulate; context white, mild, fragile, without special odor; lamellae white, equal, rarely one forked, adnate, close, rather broad, even on the margin, pruinose; stipe white, discoloring slightly upon handling, attenuate downward, stuffed, becoming hollow, up to 3.5 cm. long and 3 cm. in diameter; spores pitchpin (310, t. 3), broadly ellipsoid, apiculate, coarsely echinulate, 8.75–10 x 6.2–7.5 μ in diameter.

TYPE LOCALITY: Rock Creek, Z/T Ranch, Wyoming.

HABITAT: Under greasewood, July 20, 1920.

In dried specimens the color of the entire specimen is chamois varying from tone 1 to 3 (325). The specimens were collected by Mr. Simon Davis and he describes the habitat as follows: "The elevation was between 6,700 and 6,800 ft. Most of them were found on the south bank of Rock Creek under a thick, almost impenetrable growth of greasewood in black humus, frequently wet from the numerous showers that prevailed during June 28 to Aug. 15. The white ones were persistently white."

The species may be distinguished by the white color throughout, the mild taste, and the yellow spores. It differs from *R. basifurcata* Pk. in its simple lamellae, persistently mild taste, and white color.

Russula operta sp. nov.

Pileus convex with margin bent in to the stem, becoming plane to slightly depressed, 2.5 to 4 cm. broad, surface old-blood-red to Morocco-red in the center, to coppery-old-rose, salmon, or reddish-salmon on the margin, pruinose, viscid when wet, with separable pellicle, margin becoming striate-tuberculate; context white, reddish next the pellicle, slowly peppery, without special odor; lamellae white at first then maize-yellow, tone 1, equal, mostly simple, if forking, then close to stipe, round and broad at the outer end, narrowed at the inner and occasionally sinuate, interveined, rather

close; stipe white, rarely with a tinge of pink at the apex, pruinose above, nearly equal, stuffed becoming hollow, slender, 2–2.5 cm. long; spores pale-écru (66, t. 2), broadly ellipsoid, apiculate, unsymmetrical at the base, very coarsely and distinctly echinulate, uniguttulate, or rarely diguttulate, 6.3–7.5 μ x 7.5–7.8 μ exclusive of apiculus, which is 1.25 μ long.

TYPE LOCALITY: Newfane Hill, Newfane, Vermont.

HABITAT: In a wood road under beech, or under yellow birch with hemlocks near. August 30, 1920, and August 22, 1921.

DISTRIBUTION: In several localities on Newfane Hill.

This species resembles *Russula pusilla* Peck, but differs in the taste and in the markings of the spores. The stipe is also usually longer than that of *Russula pusilla*. The acridity seems to be located in the pileus and becomes very evident when one chews the entire pileus. In old specimens the taste may be nearly mild. It is a very pretty little species, but because of its small size it often escapes discovery.

Russula dura sp. nov.

Pileus convex, becoming plane to centrally depressed, up to 8 cm. broad; surface yellow-ocher to brownish-terra-cotta with some burnt-umber toward the center, unevenly colored, pruinose, cuticle adnate, margin even; context sweetish then bitter and disagreeable, somewhat as horse urine smells, leaving a cool sensation, without special odor, hard and compact; lamellae white then fleshy-white, becoming ocher-yellow on the edge for about 1 cm. from the margin of the pileus, equal, a few forking close to the stipe, broad, rounded at the outer end and narrowed at the inner; stipe white, washed on one side with hazel, somewhat pruinose, becoming larger below the middle, then abruptly contracted at the base, with longitudinal wrinkles, firm, up to 5 cm. long and 1.5 to 2 cm. thick; spores white, subglobose, tuberculate, apiculate, symmetrical in one view and unsymmetrical in another, a few uniguttulate.

TYPE LOCALITY: Newfane Hill, Vermont, August 22, 1921.

HABITAT: In needle soil or among leaves under beech and hemlock.

This species seems very distinct from other species in appearance, firmness, and taste. Although five specimens in different stages of maturity were found, it was not possible to obtain a mass of spores in a print, but on the lamellae they were white. The pruinose bloom remains on the pileus even when dried.

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Russula subtilis sp. nov.

Pileus broadly convex, becoming plane to centrally depressed, up to 4 cm. broad; surface slate-violet or with a faint wash of salmon-lilac, darker toward the center, pruinose, granulose toward the margin when viewed with a lens, viscid when wet, cuticle separable, margin even; context mild, then imparting a stinging sensation to the throat; lamellae white, equal, rounded at the outer and narrowed at the inner ends, subdistant, broad; stipe washed with Corinthian-red, equal or tapering downward, pruinose, especially at the apex, which is white-stuffed, 3 cm. by 1.5 cm.; spores white, somewhat ovoid to broadly ellipsoid, apiculate, unsymmetrical in one view, minutely echinulate, 7.5 x 10 μ, including the apiculus, which is 1 μ long.

TYPE LOCALITY: Newfane Hill, Vermont.

HABITAT: In wood road in beech, birch, and hemlock woods, August.

DISTRIBUTION: In two localities in the same woods, Newfane Hill, Vermont.

This species is quite different in appearance from any other nearly mild, lilac, white-spored species. It is more fragile than *Russula corallina* Burl., and the lamellae are more distant and remain nearly white in drying, while the gills of *R. corallina* become yellow. The latter species differs in color also.

Russula fucosa sp. nov.

Pileus broadly convex, becoming plane to centrally depressed, up to 5 cm. broad, surface old-blood-red (103) to coppery-red (108) or peach-red (98) to garnet-brown (164, t. 1) when mature, with some maize-yellow t. 2 in the center or elsewhere, very pruinose, viscid when wet, cuticle separable as far as the disk, margin even to faintly striate-tuberculate in places; context mild and sweet, white, staining snuff brown to putty color, developing an odor in drying slightly like that of *R. atropurpurea* Pk.; lamellae nearly white, equal, a few forking next the stipe, broad, narrow at the inner end, close, adnate, appearing free in age; stipe white or with a trace of pink, staining a little snuff brown where handled, glabrous, 3–4 x 1–1.5 cm.; spores flesh color (67, t. 2), nearly globose, very echinulate, 8.75 x 8.75 μ exclusive of the apiculus which is 1.87 μ long, the spines being 1 μ long.

TYPE LOCALITY: Newfane Hill, Vermont.

HABITAT: In moist woods of beech and spruce.

DISTRIBUTION: Newfane Hill, Wardsboro, and Londonderry, Vermont; Richmond, Staten Island, and Stow, Mass. (No. 1 of Aug. 22, 1916, Simon Davis).

This is a very beautiful species. The flesh does not become as sordid as that of *Russula atropurpurea* Pk., the odor is never very strong, and the spores are much paler. In color, the species resembles *Russula pulchra* Burl., but differs in the changing flesh, and the slight odor which develops in drying. The spores of *Russula pulchra* are nearer white. The first collection of which I have record is the one from Wardsboro in 1910. Since 1917 I have found it nearly every year on Newfane Hill. The type is based on specimens collected on Newfane Hill in 1922.

Russula Burkei sp. nov.

Pileus convex, becoming expanded with depressed, subumbilicate center, 5.5 to 7 cm. broad; surface madder-brown on the disk, shading outwards to tawny-olive, and occasionally clay-colored spots, the colors being somewhat intermingled over the central portion, viscid with pellicle separable part way to the center, glabrous, margin even, sometimes broadly undulate; context very compact and firm, white to smoky, becoming slowly vinaceous-drab where cut, slowly very acrid, odor somewhat like *Russula foetens;* lamellae white, not stained with spots, yellow in drying, equal, few or none forking, narrowed behind, rounded in front, crowded; stipe white becoming blackish-gray internally with age and somewhat discolored externally where bruised, slightly ridged, stuffed but not fragile, 4 cm. long, 1.8 cm. thick; spores pale-écru (66, t. 1), nearly globose, very minutely tuberculate, apiculate, 6.25–7.5 x 7–8.75 μ.

TYPE LOCALITY: Montgomery, Alabama.

HABITAT: Mixed woods. Type collected by Dr. R. P. Burke, July 23, 1921.

This species resembles *Russula obscura,* and *Russula rubescens* and *Russula cinerascens* in the change in the color of the flesh. It differs in its acrid taste and disagreeable odor from *Russula cinerascens,* in color, in taste, and in the spore markings from the others. In the dried state the pileus is brownish drab (302), except in the center, where it is nearly black. The lamellae in dried

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specimens are isabelline (309, t. 4). The flesh of the pileus shows blackish between the bases of the lamellae. The description has been arranged from notes made by Dr. Burke, and the colors of the fresh mushroom are named according to Ridgeway.

Russula affinis sp. nov.

Pileus broadly convex, then expanded and depressed in the center, about 6 cm. broad; surface vinaceous-fawn, fawn to army-brown in the center, periphery and middle zone smoke-gray to light-grayish-olive, or middle zone occasionally dingy-buff, slightly viscid in the center when wet, with pellicle separable half way to the center, glabrous in central portion, minutely gray-scurfy to suppressed-squamulose under the lens over the outer half, margin faintly tuberculate-striate; context white, acrid, without characteristic odor; lamellae pale-creamy-white, rust stained where bruised, close, equal, a few forking near stipe, rounded in front, tapering behind, adnexed, edges even; stipe pure-white, dingy-brown in grub holes, and all over in drying, tapering downwards, stuffed to hollow, glabrous, fragile, 3 cm. long by 12 mm. at the apex and 8 mm. at the base; spores fleshy-white (9, t. 4), broadly ellipsoid, minutely echinulate, apiculate, unsymmetrical, 6.25 x 7.5 μ, cystidia awl-shaped, granular, scattered.

TYPE LOCALITY: Montgomery, Alabama, Court St. woods, July 22, 1921.

HABITAT: Under oak trees, gregarious.

This seems to be near *Russula granulata* Pk., but may be readily distinguished by its more smoky-brown colors, its less striate margin, its less noticeable granules on the surface of the pileus, and its more echinulate spores. The striations extend in for only one half centimeter, and are scarcely discernible in the dried specimens. In dried specimens the stipe and lamellae are raw umber.

Russula chlorinosma sp. nov.

Pileus becoming expanded, centrally depressed, with incurved margin, up to 11 cm. wide; surface cream-colored to white, not viscid, glabrous to minutely or coarsely rimulose or areolate, forming appressed squamules which are sometimes Buckthorn-brown, margin even or striate only at the extreme edge, incurved; context white to pallid, unchanging, fairly firm, mild, but slightly disagreeable, odor disagreeable, suggesting chlorine; lamellae white to

1. RUSSULA DURA. Burlingham
2. RUSSULA OPERTA Burlingham

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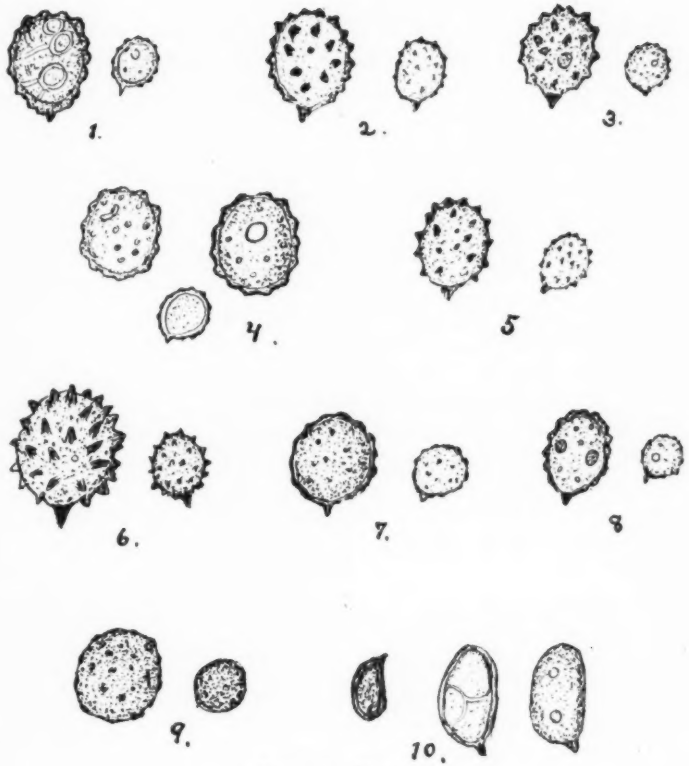

SPORES OF RUSSULA

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Massicot-yellow in side view, cream-buff in edge view, a few unequal, many forking at and near the stipe, rounded at the outer end, narrowly rounded and adnexed to almost free at the inner end, close, edge even; stipe concolorous to white, not changing color where handled or bruised, minutely pruinose at the apex, even, soft, stuffed, 2 cm. thick at the apex, 2.5 cm. thick below, somewhat ventricose, up to 9 cm. long; spores with faint tinge of cream color, nearly smooth, under the oil immersion appearing granular or minutely tuberculate, 6.25 x 7.5 μ.

TYPE LOCALITY: Montgomery, Alabama, July 31, 1921, Dr. R. P. Burke.

HABITAT: On the ground in mixed woods, fairly shady.

Dr. Burke writes regarding this species: "It is very common in South Court Street woods and gives the whole woods a chlorine odor, very disagreeable. It is too disagreeable to be kept in one's home in the dried state. The spore mass is almost white, but has a faint tinge of cream—between Ivory yellow and white (Ridg.)."

In the dried specimens the surface of the pileus reminds one of the crustose appearance of *Russula crustosa*. The odor persists up to the present time, nearly one year after collection.

556 LAFAYETTE AVE.,
BROOKLYN, N. Y.

EXPLANATION OF PLATES

PLATE 4

Fig. 1. *Russula dura.*
Fig. 2. *Russula operta.*

PLATE 5

Fig. 1. *R. Kellyi.*
Fig. 2. *R. alcalinicola.*
Fig. 3. *R. operta.*
Fig. 4. *R. dura.*
Fig. 5. *R. subtilis.*
Fig. 6. *R. fucosa.*
Fig. 7. *R. Burkei.*
Fig. 8. *R. affinis.*
Fig. 9. *R. chlorinosma.*
Fig. 10. *R. ventricosipes.*

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STUDIES ON PLANT CANCERS—VI *

FURTHER STUDIES ON THE BEHAVIOR OF CROWN GALL ON THE RUBBER PLANT, FICUS ELASTICA

MICHAEL LEVINE

(WITH PLATE 6)

In a study of the effect of crown gall on the rubber plant, *Ficus elastica* (Levine, 1921), it was shown that one of two types of crown gall may result when the internode of a young growing branch is inoculated with *Bacterium tumefaciens*. These are either benign or malignant in nature. The benign type is relatively short-lived, grows to a considerable size, becomes differentiated, and dies. It eventually drops out, leaving a scar, which in no way affects the further growth and development of the stem. The malignant type of crown gall is characterized by a localized growth which also becomes differentiated, forming a mass of parenchymatous cells with nodules of woody fibers. The conducting system of the stem is but partially invaded by the crown-gall tissue, yet the part of the branch above the gall dies as well as a part of the stem below. The death of the branch due to crown gall is at least suggestive of the death caused by malignant growths in animals.

The plants which were reported on, together with ten additional plants of the same age and size and inoculated with *Bacterium tumefaciens*, have been carefully studied since the first record was made. The subsequent observations made, it is believed, are of sufficient interest to warrant a further brief report.

CROWN GALL ON OLD STEMS OF FICUS ELASTICA

It has been stated by animal and plant pathologists that young animal and plant tissues respond to stimuli producing neoplastic growth much better than do older living things. While this is true for the rubber plant, it appears that older parts of the plant, such

* From the Cancer Division, Montefiore Hospital, Dr. Isaac Levin, Chief.

as the bark-covered portions of the main stem and older branches, respond very rapidly to inoculations of *Bacterium tumefaciens*. Figure 1 represents the results of an inoculation of a tree 8 feet tall, having a diameter of approximately two inches, with an emulsion of *Bacterium tumefaciens*. Small and isolated nodules of hyperplastic tissue appeared from 2 to 3 months later in each inoculated opening made by the needle. These grew rapidly and became confluent, as shown in the photograph taken 3 years after the inoculations were made. The crown galls became differentiated and formed a woody structure which could easily be removed from the tree by the application of slight lateral pressure. On examination, the parts removed were dead, dark-brown in color, and of a corky consistency. The part of the gall remaining was active and exuded the characteristic latex of the rubber plant. Subsequent growth resulted in the development of a larger crown gall on the part where the dead portion was removed, and at the end of the season the necrotization of the new growth formed a deep wound in the stem, as shown in the dark area to the right in the photograph. The globular crown galls seen to the left are new growths of the third year.

These observations are in complete accord with those of Toumey (1900) described for the spontaneous overgrowths occurring in the almond.

Figure 2 represents an enlargement of the branch illustrated in figure 3, showing a crown gall artificially induced by inoculating an old, bark-covered branch (figure 3, arrow) with *Bacterium tumefaciens*. The growth is 3 years old, and is quite active. The central portion, indicated by the arrow, is new growth, rather smooth, and made up of living tissue from which a latex is obtained on injury. To the left of the area are the remnants of the growth of the previous years. The health of the branch has not been affected, as can be seen by the abundant foliage. Crown gall is not a dangerous disease, at least when induced experimentally, in the rubber plant. The figures mentioned above represent a series of six such experiments. While no plant has been killed, it is reasonable to assume that if growth proceeds as already begun, it is but a matter of time before the stem will be weakened by the suc-

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cessive necrotization of the crown-gall tissue, so that there will be no resistance offered to the effects of winds. Studies of crown galls on the apple to be reported later, resulting from inoculations of *Bacterium tumefaciens* into the stems, behave similarly and my observations confirm the results of Hedgcock's (1910) findings in his field studies on this plant.

CROWN GALLS ON TERMINAL PARTS OF YOUNG BRANCHES

It has been shown by my earlier studies of the crown gall on the terminal or green parts of the branch of a rubber plant that the neoplastic growth resulting from an inoculation of an axillary bud or internode of the stem grows rapidly, and in the course of a year dies. As mentioned above, the parts of the branch above the crown gall and for a distance below died also. While the phenomenon may be attributed to the effects of the crowngall cells or the bacterium, the further study of the branch below the necrotized part of the stem below the crown gall is very interesting, and suggests that the bud stimulation, which Smith (1916) refers to as a " pathological phenomenon," is in reality an effect which operates in a way comparable to decapitation without the removal of the parts. The growths which appear on these stems are suggestive of the stimulus that operates in producing axillary crown galls, such as appear in the rubber (Levine, 1921—figs. 8–10), and the aberrant types of axillary crown galls, such as I described for the tobacco plant (1923).

Figure 4 represents a tree of *Ficus elastica* which had been inoculated with *Bacterium tumefaciens* 2 years and 5 months previous to the time the photograph was taken. The dark mass of tissue to the upper left in the photograph represents the crown gall with the necrotized tip of the branch. Shortly after the necrosis of the crown gall and stem occurs it is noted that one of the buds nearest the necrotic stem-tissue begins to sprout into a short branch from which a single leaf develops in less than 6 months. This branch grows rapidly and a large number of normal leaves are developed as shown in the photograph. The orientation of the branch appears aberrant and now, approximately three years after its development, a normal negative geotropic reaction is becoming visible.

Another plant from which the wind broke the major part of the necrotized apical portion of the stem with its crown gall is shown in figure 5. The dead part of the branch appears in the center of the picture. An apical internode was inoculated 3 years previously. The crown gall developed in the usual manner. The necrosis of the crown gall and parts of the branch was followed by the development of a number of buds which, however, formed a number of small branches, each bearing two to three leaves. These are normal in appearance and apparently in function. Several plants showed this production of stems with leaves after the crown gall and the parts of the branch above and below the crown gall had died.

A third series of cases shown in figure 6, somewhat more complicated than the previous two, was observed after necrosis of the branch with its crown gall had resulted. The growth shown in the picture is 2½ years since the inoculation was made. A bud developed shortly after the death of the crown gall and parts of the stem above and below the crown gall took place. It grew rapidly into a branch (shown by the arrow) with a normal number of leaves similar to the one shown in figure 4. The orientation of the shoot is, however, aberrant in this case, as is the one cited in the first instance. The other interesting fact is that the buds below the necrotized parts of the branch become active for a considerable distance down the stem, and in figure 7, a stage 2 months later than the one shown in figure 6, we find that a number of young branches have developed.

The appearance of these branches on the upper part of the stem only seems to be abnormal. However, comparisons of this growth were made with decapitated branches shown in figures 8 and 9. The horizontal branch shown in figure 8 was decapitated 6 months previously. The low temperature at first interfered with its growth somewhat, but for the last 3 months before the photograph was made the rate of growth was rapid, and, while as many as ten buds along the stem appear to have been stimulated, only one grew into a small branch, of which two leaves are beginning to unfurl.

In figure 9 a much older branch was decapitated a year previous to the time of the taking of the photograph. While a considerable

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number of dormant buds were stimulated to develop, the positions of the stimulated buds are confined more to the side of the branch away from the camera, and the appearance is therefore not unlike the bud development shown in figure 7.

An analysis of the material shows that a crown gall produced on the apical part of a branch of *Ficus elastica* necrotizes, and with it die the parts of the branch above and below the gall. The nearest axillary bud of the part of the stem below this necrotized area sprouts out and produces a small branch. This is followed some time later by the budding-out of a number of dormant axillary buds along the length of the branch, not unlike the budding-out of the dormant buds of similar branches which are decapitated.

This suggests that the development of buds after inoculation with *Bacterium tumefaciens* into the axillary leaf buds of a stem is due to a localized stimulation of a mechanical nature rather than a pathological one. Further, the necrotizing area acts as a mechanical stimulus in a measure comparable to decapitation; the complete stimulating effect of decapitation possibly being inhibited by the effects of the crowngall cells or the bacteria. When complete necrosis of the crown gall and adjacent parts of the stem occur, the living parts of the stem function as does a decapitated branch and the dormant buds develop.

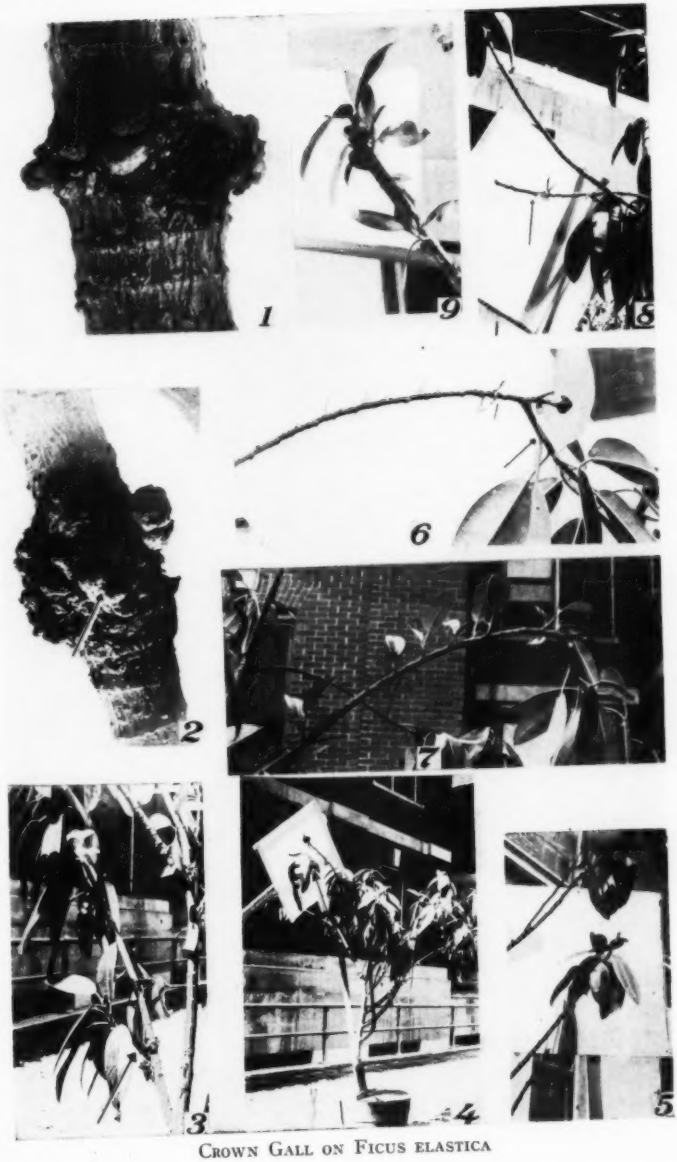
This suggests further that all the axillary-bud-crown-gall formations are not of a pathological origin, but develop as a result of a mechanical stimulus similar to decapitation.

SUMMARY

1. Further studies on the effect of crown gall on *Ficus elastica* show that buds below the necrotized crown gall and stem developed into branches and leaves.

2. The regularity of the development of the dormant buds suggests that axillary buds developed when inoculated with the crowngall organism are not due to the effect of bacteria, but to a localized mechanical stimulation similar to decapitation.

3. The complete stimulative effect is inhibited by crown gall and only when complete necrosis of the crown gall and adjacent parts occurs is the mechanical stimulus allowed to act.



CROWN GALL ON FICUS ELASTICA

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EXPLANATION OF PLATE 6

Fig. 1. Main stem of rubber plant, *Ficus elastica,* inoculated with *Bacterium tumefaciens,* showing old necrotized area to the right and new small galls 3 years after inoculation.

Fig. 2. Smaller branch showing new growth in center following the death of the crown gall of the previous years.

Fig. 3. Shows position of crown gall on stem shown in figure 2.

Fig. 4. Dead crown gall with apical portion of branch. The bud below the dead part developed into a branch with numerous leaves.

Fig. 5. Part of dead branch from which the dead crown gall and the tip of the branch are removed. The dormant buds below the necrotized parts developed into a number of small branches.

Figs. 6–7. Successive stages in development of dormant buds of a branch bearing a crown gall. Fig. 6, a branch similar to one shown in fig. 4 developed shortly after necrosis of the crown gall. The dead part of the branch above the crown gall was broken off.

Fig. 8. Normal young branch decapitated six months previously, showing irregular development of dormant axillary buds.

Fig. 9. An old normal branch decapitated, showing irregular distribution of developing axillary buds one year after decapitation.

MONTEFIORE HOSPITAL,
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A NEW HYSTERIUM FROM ILLINOIS

L. R. Tehon and P. A. Young

Most, if not all, of the known species of *Hysterium* are believed to be saprophytic. The attention they receive is small, for even the confirmed mycologist, with his studies directed toward parasitic fungi as an economic justification for his occupation, finds little time to devote to this kind of fungus.

However valid such an attitude may be, it is true that species of *Hysterium* and other fungi of a similar habit do have a useful rôle in the eventual return of plant parts to the soil from whence they came. In the unending evolution of plants from the soil, and the return to the earth of its own substance enriched and expanded through its change to organic material, the last great process falls to the lot of fungi and bacteria. Theirs is the task of reduction from conventional plant form to crumbled humus. What the whole process is must remain unknown for a long time, but occasional observations may add to our knowledge from time to time. The writers present this account with the intention of recording one more of the many species of fungi concerned in this task.

Of the species of *Hysterium* immediately available to us in exsiccati, all are bark inhabiting. *H. pulicare* Pers. with its several varieties is apparently limited to a bark habitat. Undoubtedly these fungi, whose characteristic habitat is the bark of dead or fallen trees, function in a real degree in the ultimate decay of the bark tissues of many of our forest trees.

On May 12, 1923, P. A. Young visited White Heath, in Piatt County, Illinois, for the purpose of collecting parasitic fungi. During his search he observed a fallen and nearly decomposed sycamore log, some of the bark of which was covered with the apothecia of an hysteriaceous fungus. This material was brought to our laboratory and subjected to microscopic examination in order to check up its agreement with a preliminary determination as *Hysterium pulicare* Pers. The examination, while demonstrating that the fungus was clearly a species of *Hysterium,* revealed

certain morphological discrepancies which lead the writers to believe that it can not be considered conspecific with any of the members of this genus so far described.

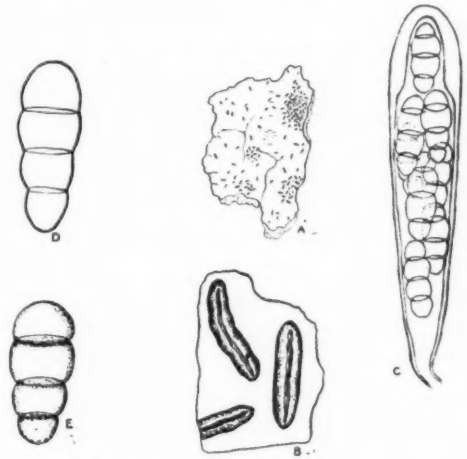

FIG. 1. *Hysterium pulcherrimum.*
A. Habitat sketch; *B.* Apothecia; *C.* Immature ascus; *D, E.* Spores.

Associated with the conception of the saprophytic character of these fungi, there has grown up a notion that the saprophytism is facultative rather than obligatory. If a facultative saprophytism is correctly ascribed to these fungi, its effect upon their morphological characters has not as yet been made clear. It appears to the writers, therefore, that there is no more satisfactory way of recording the present specimen than to give it specific rank.

Hysterium pulcherrimum sp. nov.

Apothecia irregularly disposed, densely gregarious or widely scattered, elongate, black, carbonaceous, rupturing longitudinally, 300–800 x 130–235 μ, 150 μ high, distinctly and neatly formed. Asci clavate, 40–70 x 10–12 μ, 8-spored. Spores mostly clavate, fuscous to olivaceous and uniformly colored throughout, mostly 3-septate, 11–18 x 4–7 μ. Paraphyses abundant, filiform, exceeding the asci in height, branching abundantly towards the apex, the branches coalescing to form a carbonaceous epithecium often 10–20 μ thick.

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TYPE: On the bark of a fallen tree (*Platanus occidentalis* L.) at White Heath, Illinois, May 12, 1923. Collected by P. A. Young. Deposited in the herbarium of the Department of Botany, University of Illinois.

This species differs from *H. pulicare* Pers., with which it appears most closely allied, especially as regards spore size, those of Persoon's species measuring 27–33 x 8–10 μ. The macroscopic aspect is quite different, as well, when the two are compared, ours being much more clear-cut and neat in appearance, the apothecia more abundant and decidedly smaller. The gelatinization of immature asci and the thick carbonaceous epithecium are likewise characteristic. The characters of our species are shown in the accompanying drawings.

STATE NATURAL HISTORY SURVEY,
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THE AECIAL STAGE OF PUCCINIA PATTERSONIANA

A. O. Garrett

On June 21, 1920, the writer collected in Parley's Canyon, at Gogorza, Summit Co., Utah, an aecium on *Brodiaea Douglasii* S. Wats. The plants of *Brodiaea* were growing on the side and at the bottom of an embankment running east and west, consequently they had more or less protection from the sun. These *Brodiaea* plants were all of the first year's growth, and the leaves had begun to wither. Supposing that the aecium was that of the well-known *Uromyces Brodiaeae* Ellis & Hark., a careful but unsuccessful search for telia was made on the withering and withered leaves.

Along the top of the embankment *Agropyron spicatum* (Pursh) Scrib. & Smith was growing, and on this grass uredinia were beginning to show. A specimen of the uredinia was sent to Dr. Arthur, and determined as those of *Puccinia Pattersoniana.*

From the abundance of the aecia on *Brodiaea,* the close proximity of the two host plants, the fact that the aecium was not followed by a later stage on the *Brodiaea,* and the further fact that *Elymus condensatus,* which abounds in the region, is always heavily infected by *Puccinia Pattersoniana,* the writer concluded that in all probability this aecium on *Brodiaea* is the alternate stage of *Puccinia Pattersoniana.*[1]

Acting on this suggestion, Dr. E. B. Mains conducted some correlation studies, in which he found that *Puccinia Pattersoniana* and the short-cycled *Puccinia Moreniana* on *Brodiaea capitata* Benth. have teliospores nearly identical in size, in thickness of the walls and with striking longitudinal striations. Moreover, the pedicels of the teliospores of both were stained dark blue by iodine. As a result of these studies, Dr. Mains concludes: "In the light of the observations of Dietel and Fischer and the work of Tranzschel, the striking resemblance between the teliospores of

[1] Garrett, A. O. Mycologia 13: 104, 110. 1921.

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these two rusts strongly indicates that *Puccinia Pattersoniana* has its aecial stage on *Brodiaea*. This also, when taken with the field association noted by Prof. Garrett, can leave but little doubt as to the connection." [2]

In May and June, 1922, the writer found the aecia and the telia growing in close juxtaposition not only at Gogorza, but also at a number of other points, continuing at least eight and a half miles down the canyon. At the station eight and a half miles down the canyon, the close association of heavily rusted plants of *Elymus* and *Brodiaea* was very convincing of the connection of these two rusts. Rusted *Brodiaea* plants were also seen from Lamb's Canyon, a tributary of Parley's Canyon. Below Gogorza, however, the rusted *Brodiaea* plants were mature and flowering.

In March, 1923, a plant of *Elymus condensatus* was transplanted to a protected place in the writer's garden from a large clump growing not far from the East High School. This clump had been under observation for several years, and was known to be free from rust. On May 17, accompanied by Mr. L. A. Giddings of the East High School, whose hearty co-operation made the work possible, a trip was made to Parley's Canyon, where an abundant supply of the aecia on *Brodiaea* was secured. The *Elymus condensatus* in the garden, after being thoroughly sprayed, was inoculated with scrapings from the aecia on the *Brodiaea*. In addition, about a double handful of infected *Brodiaea* leaves were supported among the leaves of the *Elymus*. It began to rain at 7.45 P.M., within an hour after the inoculation was completed. During the night a trace of rain, or else a good shower, fell every hour, so that by morning a total of 0.62 inch had fallen. At 6 A.M. the following morning the temperature was 54°, and the relative humidity 78 per cent. As will be seen, these conditions were unusually favorable for outdoor inoculation work.

On May 30 uredinia were beginning to show on the *Elymus*. By June 7 the *Elymus* was heavily infected with uredinia, scarcely a leaf escaping, with telia beginning to make their appearance. On June 9 I collected forty leaves from the *Elymus*, many of them almost entirely covered with uredinia. Perhaps ten or fifteen infected leaves remain on the plant.

[2] Mains, E. B. Ind. Acad. Sci. 1921: 133–135. 1922.

On June 8 the clump of plants from which the inoculated plant was taken was inspected for rust, but it was absolutely free. Moreover, there is no chance for the *Elymus* plant to have been infected from wind-borne spores from *Brodiaea,* as the nearest infected plants are twenty miles away.

The above experimental results remove all doubt that the aecial stage of *Puccinia Pattersoniana* is found on *Brodiaea.*

It seems to me that one point is emphasized by these results—that *any* aecium occurring abundantly associated with a telial form whose aecium is unknown should be looked on with suspicion, provided the aecium does not later develop the telium supposed to be associated with it.

EAST HIGH SCHOOL,
SALT LAKE CITY, UTAH

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NOTES AND BRIEF ARTICLES

(Unsigned notes are by the editor)

Dr. O. A. Reinking has resigned from the University of the Philippine Islands and is now located in Honduras as plant pathologist for the United Fruit Company.

The stem-spot disease of the common rush, *Juncus effusus,* so extensively cultivated in Japan for the manufacture of mats is attributed by M. Kasai to the attacks of a fungus which he describes as *Cercosporina juncicola.*

According to Léon Azoulay, the color of the spores of gill-fungi may be obtained very quickly by passing paper, cloth, or a feather between the gills. In specimens having milky juice care must be taken to distinguish between the spores and the milk.

A provisional list of the parasitic fungi of the Philippine Islands prepared by C. G. Welles was published in the *Philippine Agricultural Review* for 1922. It includes 260 genera and 958 species of fungi, with hosts and a host index.

In *Phytopathology* for December, 1922, Lee Bonar describes a new hickory canker on *H. ovata* in Michigan caused by *Rosellinia caryae.* It attacks the twigs and trunks of young trees, causing dead, sunken areas; and in some cases the trees were entirely killed.

Three fine plants of *Agaricus rubribrunnescens* appeared in my lawn at Bronxwood Park on August 3, 1923, and were dried for the Garden herbarium. They grew under a red maple about two yards from the spot where I collected the type specimens on September 8, 1916.

Phytophthora cinnamoni has been described by R. D. Rands as the cause of a bark canker of cinnamon trees in the uplands of the

west coast of Sumatra, which is particularly destructive in badly drained plantations. Susceptible trees are usually killed by this disease and by insects within a year after attack, before they reach the most valuable age for harvesting.

A series of two or three papers on the Gastromycetes of North Carolina by Coker and Couch was begun in the *Journal of the Elisha Mitchell Scientific Society* for May, 1923. The first paper includes species of *Clathrus, Simblum, Mutinus, Ithyphallus,* and *Dictyophora,* all of which are abundantly illustrated with half-tone plates.

Dr. Weir reports in *Phytopathology* that *Polyporus Spraguei* causes a brown, friable rot in the heartwood of the trunk and roots of living oak and chestnut. Sections of chestnut trunks infected with the mycelium of this fungus developed hymenophores within a comparatively short time.

A brief report was made by N. L. Cutler in *Phytopathology* for June, 1923, on some of the tree-destroying fungi of the Vancouver forestry district; 24 species being considered important. Several hosts were recorded, but *Pseudotsuga taxifolia* and *Tsuga heterophylla* were attacked by far the largest number of fungi.

Microörganisms in the leather industries have been treated by F. A. Mason in a series of articles published in the *Bulletin of the Bureau of Bio-Technology,* London. In the genus *Penicillium,* for example, four species are found on leather, but only two, *P. decumbens* and *P. expansum,* are at all common.

Vermicularia zingibereae is the name proposed by S. Sundaraman for a new disease of ginger in the Godavari district of India. It appears on the leaves in circular, yellow spots, which enlarge, become discolored, and often die. Even the scaly leaves on the rhizomes are attacked in very severe cases.

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Pear blight may now be controlled, according to H. S. Jackson, especially if the Kieffer and other resistant varieties are planted. A good solution for disinfecting the tools and the wounds made in removing affected branches is said to be 1 part of corrosive sublimate and 1 part of cyanide of mercury to 500 parts of water.

Bulletin No. 7, Part 2, of the *Natural History Survey* of the Chicago Academy of Sciences, by W. S. Moffatt, is an illustrated handbook of the Gastromycetes found in the region of Chicago. With the aid of this pamphlet, the collector should be able to trace most of the species of the group occurring in the district covered.

Very fine specimens of *Daedalea ambigua* were received on August 1 from Gainesville, Florida, collected on an oak log by Mr. G. F. Weber. These specimens were milk-white, with an ochraceous stain on the margin where bruised, and to some extent also on the hymenium where attacked by insects. The tubes were fine, small, and daedaleoid. The specimens were still fresh when received and had a faint but distinct odor of anise. The largest measured 13 inches in width, 6 in length, and 1½ in thickness at the base.

Part 1 of a descriptive catalogue of the Formosan Fungi prepared by Kaneyoshi Sawada and published by the Agricultural Experiment Station at Taihoku, Formosa, dated December, 1919, reached me September, 1923. It is a handsome volume of many pages, well illustrated with full-page plates. The text is, of course, in Japanese, but the scientific names and an index to them are in Latin. The parasitic species naturally receive most attention.

A most attractive illustrated paper by Charles Drechsler on some graminicolous species of *Helminthosporium*, reprinted from the *Journal of Agricultural Research* for May 26, 1923, is the first of a series on this important and difficult genus. Among the many species discussed the following are described as new: *H. catenarium, H. dictyoides, H. siccans, H. stenacrum, H. triseptatum, H. vagans, H. monoceras, H. halodes, H. leucostylum, H. micropus, H. rostratum,* and *H. cyclops.*

Brébinaud makes some interesting observations on boletes in Bull. Trimest. Soc. Myc. de Fr. for 1921. Changes in the color of the pileus, he says, are due to variations in moisture; while the reticulations present at times on the stipe are remnants of the ruptured tubes. He claims also that the mycelium of the boletes, which develops mostly in holes made in the soil by insects and rodents, is of two kinds, one for nutrition and the other for respiration.

Dr. H. H. York, Pathologist in the Office of Forest Pathology, Bureau of Plant Industry, U. S. D. A., accepted the position of Forest Pathologist, Division of Forest and Lands, Conservation Commission, Albany, N. Y., beginning July 1, 1923. For the present, Dr. York will continue to work upon the white pine blister rust, but other forest disease work will be taken up later.

Dr. James R. Weir, who for the past ten years has been in charge of the field investigations of the Office of Forest Pathology, Bureau of Plant Industry, for District 1 of the U. S. Forest Service (Montana, Idaho, western Washington, western Oregon, South Dakota, Minnesota, and Michigan), with headquarters at Missoula and Spokane, has given up this position and is now directing the work of Pathological Collections in the same Bureau. This Office deals with the classification of fungi and maintaining the extensive mycological collections of the U. S. Department of Agriculture.

The gray mold of the castor bean, caused by *Sclerotinia ricini*, was fully described and illustrated in a handsome paper by G. H. Godfrey published in the *Journal of Agricultural Research* for March 3, 1923. The disease is a typical Botrytis blight. The perfect stage of the fungus was developed artificially and also found in nature. This disease was originally introduced in seed from India; and control measures depend chiefly upon seed treatment rather than upon fungicides applied to infected plants.

The morphology, development, and economic aspects of *Schizophyllum commune* are discussed by F. M. Essig in Univ. Calif.

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Pub. Bot. for 1922. The hymenium arises in an apical cavity, which is very peculiar. The so-called lamellae are, according to the author, only the edges of smooth hymenial areas and the genus therefore belongs in the Thelephoraceae. This species can grow upon living wood if the conditions are particularly favorable, but probably does little damage.

A bacterial leafspot of the cultivated geranium (*Pelargonium*) in the Eastern United States has been investigated by Nellie Brown and the results published in the *Journal of Agricultural Research* for February 3, 1923. This is mostly a greenhouse disease, which can be largely controlled by regulating the air, temperature, and moisture and giving the plant plenty of room. All spotted leaves should be destroyed and very sensitive varieties discarded. *Bacterium pelargoni* is the name assigned to this new organism.

Cultivated and wild hosts of sugar-cane, or grass, mosaic are discussed by Brandes and Klaphaak in the *Journal of Agricultural Research* for April 21, 1923. The following statements appear in the authors' summary: (1) Thirteen species of grasses have been proven by inoculation to be susceptible to this disease. (2) All species tested for seed transmission of mosaic gave negative results. (3) Field observations indicate that natural infection of sorghum, pearl millet, crab-grass, bull-grass, *Chaetochloa magna,* and *Brachiaria platyphylla* is widespread near affected cane in the sugar-cane belt.

The origin of the central and ostiolar cavities in pycnidia of certain fungous parasites of fruits—especially in *Phyllostictina carpogena, Sclerotiopsis concava,* and *Schizoparme straminea*—has been investigated by B. O. Dodge and the results published in the *Journal of Agricultural Research* for March 3, 1923. The following is quoted from the author's summary: "The intermediate stages in the development of the pycnidia of three species of fungi associated with fruit rots have been studied, and in each case it has been shown that the initial stage in cavity formation consists in the disorganization of cells in a certain region, accompanied by

a swelling of the cell remains. The pressure thus resulting tends to enlarge the cavity, maintain a symmetrical contour, and contribute further toward cell destruction or change of form. Further enlargement of the cavity may be effected by the growth of elements already present or by the addition of new tissue."

A recent important bulletin on potato wart published by the U. S. Department of Agriculture contains the following: "A number of American varieties of potatoes have been shown to be immune to wart caused by *Synchytrium endobioticum* (Schilb.) Perc. This conclusion is based upon tests extending from one to four years in which such varieties remained free from wart infection when grown in heavily infested soil in which susceptible varieties were generally and severely infected.

"Most of the varieties of tomatoes tested have proved to be susceptible to wart, but some of the tests have been inconclusive, and it is not yet certain whether different degrees of susceptibility and resistance exist in the tomato. In general, the tomato becomes infected less readily than the potato, requiring particularly favorable environmental conditions and appropriate stages of host development.

"A number of solanaceous plants, including the native solanaceous weeds of Pennsylvania, and the eggplant, tobacco, petunia, and pepper, which are in common cultivation, have been tested for susceptibility to the wart pathogen, but infection has thus far failed."

THE EUROPEAN MISTLETOE[1]

Professor K. von Tubeuf, the well-known Plant Pathologist of the University of Munich, has recently published a monumental work on the European mistletoe, *Viscum album*, under the title "Monographie der Mistel." The volume, a distinguished example of modern bookcraft, is a veritable encyclopedia on mistletoe, treating the subject exhaustively and critically from every conceivable angle. In view of the close relationship existing between

[1] Tubeuf, Karl von, "Monographie der Mistel." R. Oldenbourg, Munich and Berlin, 1923.

Viscum and our American genus *Phoradendron,* Tubeuf's monograph offers a wealth of information and suggestions of immediate value on this side of the ocean.

An interesting chapter is devoted to fungi found on European mistletoe. In particular a description of *Sphaeropsis visci* (Sollm.) Sacc. is given.

According to Tubeuf, the fungi found on *Viscum* are partly saprophytes which cause the breaking down of dead leaves and stems, partly of a hemiparasitic nature. *Sphaeropsis visci* comes closest to being truly parasitic.

E. P. MEINECKE

THE LARGER BRITISH FUNGI *

" The object of this Handbook," says Mr. Rendle in the preface, " is to supply an introduction to the study of the larger British fungi. When considering the preparation of a new edition of the ' Guide to Sowerby's Models of British Fungi,' by the late W. G. Smith, which had served also as an introduction to the systematic study of the larger fungi, it was thought that its value might be increased by including all the British genera of Basidiomycetes. This has now been done, and additional figures have been added from Smith's ' Synopsis of British Basidiomycetes.' The Introduction has been greatly extended, the descriptions generally have been revised and enlarged, and additional matter of economic and biological interest has been included. Mr. Ramsbottom has, in fact, rewritten the book, while retaining the form and arrangement of the original ' Guide.' "

The volume contains 222 pages of text and 141 figures. The introduction treats of fungi in general and their main groups; fairy rings; luminosity; mycorrhiza; changes in color when sporophores are cut or broken; poisonous and edible fungi; fungi as food; and the ecology of the fungi. Under Basidiomycetes, the author treats at some length not only their classification, but also their cytology, morphology, and development. In connection with *Amaniata phalloides,* the deadly poisonous fungi are discussed,

* Ramsbottom, J. A Handbook of the Larger British Fungi, pp. i–iv, 1–222. British Museum, London, 1923. Price, 7/6.

with symptoms and treatment; while under *Psalliota campestris* the growing of mushrooms is described. In the same way, much interesting and valuable information is distributed throughout the volume in connection with suggestive species.

No attempt has been made to alter nomenclature or to eradicate certain errors common to most texts on this subject. The book can be recommended to students as probably the best guide to the larger fungi of England to be had in compact form, and as a very convenient introduction to most of the genera of the basidiomycetes and ascomycetes occurring in temperate regions.

W. A. MURRILL

PRUDENCE MAL PLACÉE

Une de mes amies, Mme D . . ., ardente mycophage, m'a raconté l'histoire suivante:

Dans les clairières des bois de son pays, elle fit un jour une abondante récolte de Champignons qu'elle détermina *Lepiota procera.* Cette espèce, d'excellente réputation, mais inconnue encore de Mme D . . ., lui promettait une perspective de bons diners. En rentrant chez elle, elle passe devant une voisine qui s'exclame: "Les beaux Champignons! . . . Et bons surtout! si j'en crois mon petit livre; je vais en manger ce soir. Mais au fait, prenez-en donc; j'en ai bien pour deux." Et Mme D . . ., laisse à sa voisine de quoi faire un plat de Champignons.

Mme D . . ., de retour chez elle, se dit, tout en préparant son diner: "En somme, je n'ai pas encore mangé cette espèce; elle ressemble évidemment bien à *L. procera;* mais est-on jamais sûre? Puisque Mme X . . . doit les manger ce soir, je les mangerai demain."

De son côté, Mme X . . . se dit: "Après tout, je ne connais pas ces Champignons; puisque Mme D . . . doit les manger ce soir, je vais attendre à demain, se sera plus prudent."

Le lendemain, ces deux dames s'apercoivent: "Elle n'est pas malade, se dit Mme D . . . ." "Elle n'est pas malade, se dit Mme X. . . ." Et chacune, rassurée, mange le soir même un plat de Champignons.

Quelques jours après, Mme D . . . et Mme X . . . se rencontrent: " Il faut que je vous fasse une confidence," dit-celle-ci à son amie. " J'avais quelques craintes au sujet des Champignons, et prudemment, j'ai attendu au lendemain soir pour les manger. Vous ayant aperçue le matin, j'etais bien sûre qu'ils ne vous avaient pas rendue malade."

Mme D . . . eut d'abord un petit frisson rétrospectif; puis un fou rire la secoua de la tête aux pieds. A son tour, elle raconta qu'elle avait employé le même moyen. . . .

La morale de cette histoire est qu'il ne faut pas plus compter sur les limaces pour apprendre si un Champignon est comestible ou vénéneux.

S. DECARY
in *L'Amateur de Champignons*

WOODSTOCK FUNGI

The fungi listed below were collected at Woodstock, New York, on September 3 after a light rain which did not break the unusually severe drought, but proved sufficient to develop hymenophores in low mixed woods subject to overflow or natural irrigation during spells of wet weather. Very few species were found in the fields or upon lawns.

I was the guest of Dr. John A. Kingsbury, who was not only responsible for most of the collecting, but also arranged a handsome mushroom exhibit at his home and invited a number of Woodstock people to see it. The following day we went to Yama Farms and found other interesting specimens, among them a fairy ring of the gemmed puffball fully thirty feet in diameter.

I

Boletus luteus
Ceriomyces communis
Ceriomyces ferruginatus. Common
Ceriomyces viscidus
Clavaria flava. Abundant
Clavaria pistillaris
Fistulina hepatica. Abundant
Gyroporus castaneus
Hydnum repandum

Lactiporus sulphureus. Abundant
Leotia lubrica
Phaeolus sistotremoides
Rostkovites granulatus

II

Armillaria putrida. Abundant
Chanterel aurantiacus
Chanterel floccosus. Common
Clitocybe clavipes
Cortinarius alboviolaceus. Common
Cortinellus rutilans
Drosophila appendiculata
Drosophila Storea. A rare species
Entoloma Grayanum
Gomphidius nigricans
Gymnopus dryophilus
Gymnopus radicatus
Hydrocybe conica
Hygrophorus jozzolus
Hypholoma lateritium. Common
Laccaria laccata
Laccaria ochropurpurea
Lactaria deliciosa. Common
Lactaria grisea
Lactaria indigo. Common
Lactaria ligniota
Lactaria maculata
Lactaria piperata. Common
Lactaria plinthogala
Lactaria subdulcis
Lactaria trivialis
Lepiota naucina
Lepista personata. Abundant on a pile of grass and trash in the woods
Marasmius caryophylleus
Mycena gloiocyanea. A single specimen on a dead stick in moist woods
Monadelphus illudens. Abundant, and every specimen phosphorescent
Omphalopsis campanella. Abundant
Omphalopsis fibula
Prunulus Leaianus
Russula bifida
Russula delica
Russula emetica
Russula foetens. Common
Russula Mariae
Russula obscura. Common
Russula subusta
Tapinia lamellosa
Vaginata agglutinata
Vaginata farinosa
Venenarius phalloides. Common

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III

Bovista pila
Bovista plumbea
Calvatia Bovista
Lycoperdon gemmatum
Lycoperdon cruciatum
Scleroderma subpurpureum. Common

On September 17, Dr. Kingsbury wrote me that a good rain had brought out an abundant crop of mushrooms at Woodstock. Both *Clavaria flava* and *Chanterel floccosus* were found growing in large fairy rings. *Chanterel cibarius, Chanterel cinnabarinus,* and *Agaricus campester* were collected in sufficient quantity for the table; while the giant puffball that was the size of an egg on September 3 had increased to twice the size of a man's head and was being eaten day by day, a slice at a time, without disturbing its underground connections.

Back of Outlook Mountain, Dr. and Mrs. Kingsbury found quantities of fungi with many additional species, including *Pholiota adiposa* and *Piptoporus suberosus;* the latter species occurring commonly on the trunks of white birch, which it attacks parasitically and often destroys.

W. A. MURRILL

ADDITIONS TO THE RUST FLORA OF THE WEST INDIES

The rusts have been so thoroughly collected in Porto Rico by Stevens, Whetzel, Olive, and various other visiting and local mycologists that during our recent visit we had much difficulty in finding one on a host which had not been recorded by Dr. Arthur in his work on the rusts of the island. Even the rust flora of the Virgin Islands is so similar to that of Porto Rico that little new material could be found. However, a few items of information have resulted from our work, including one new species, and it seems well to publish these fragments of additional knowledge at this time. Although the bulk of the Porto Rican collections has not yet been critically worked, so far as they could be checked in the field, no other new material in this group of fungi has been taken by us.

The work of the writer was carried on in company with Dr. N. L. Britton, whose knowledge of the phanerogamic flora of the island enabled him to supply the necessary determinations of hosts in the field. This together with Dr. Arthur's check list and host index of the rusts made it possible to readily detect species on hosts not previously reported or which were likely to be new.

The rusts from the Virgin Islands and those from Porto Rico which appeared to be of interest were sent to Dr. Arthur and Prof. H. S. Jackson, and to them I am indebted for the determinations and notes on species not previously recorded or of interest otherwise.

PUCCINIA ESCLAVENSIS Deit. & Holw.; Holway, Bot. Gaz. **24**: 29. 1897

The species was originally described from material collected on *Panicum bulbosum* H.B.K. at Esclava near the city of Mexico by E. W. D. Holway. According to Dr. Arthur the species is common from southwestern United States south through Mexico and Central America, but has not previously been known from the West Indies.

Our specimens on *Valota insularis* Chase were collected on the island of St. Thomas in the hills back of the town of St. Thomas.

PUCCINIA HUBERI P. Henn. Hedwigia Beibl. **39**: 76. 1900

The species was collected at Anna's Hope in the vicinity of the Experiment Station on the island of St. Croix. The host, *Panicum adspersum* Trin., which was determined by Mrs. A. Chase, proved to be a new host for the fungus. Incidentally the host was also new to the flora of St. Croix.

Uromyces Anthacanthi H. S. Jackson, sp. nov.

O. & I. Pycnia and aecia unknown.

II. Uredinia epiphyllous, closely gregarious and arranged in a concentric manner in areas 5–8 mm. across, tardily naked, cinnamon brown, ruptured epidermis conspicuous and overarching; urediniospores obovoid, 20–26 by 26–30 μ, wall thin, 1–1.5 μ, golden yellow, finely and moderately echinulate, the pores obscure, apparently two, slightly super-equatorial.

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III. Telia like the uredinia, chestnut-brown; teliospores globoid or broadly ellipsoid, 20–24 by 26–30 μ, rounded above and below, wall chestnut-brown, uniformly 1.5–2.5 μ thick, finely and rather inconspicuously verrucose; pedicel colorless, equaling the spore or shorter.

On leaves of *Anthacanthus spinosus* Nees, St. Croix, March 18–25, 1923, *F. J. Seaver 928.*

The material is somewhat old, the center of the groups consisting of empty sori, or desiccated tissues. No evidence of pycnia or aecia was found, so that it is impossible to determine the type of life history. All other species of *Uromyces* on Acanthaceae of which we have any knowledge have teliospores with smooth walls or in which the wall is decidedly thicker at the apex. (*H. S. Jackson, Sept. 25, 1923.*)

The above description and note were supplied by Prof. Jackson. The species was collected in some abundance in the vicinity of the lighthouse near the west end of the island. The sori were at first covered so that the fungus was thought to be a *Phyllachora.* Later, some of the sori were detected in which the epidermis had ruptured, exposing the rust spores. On returning to Porto Rico a careful search was made, in company with Mr. C. E. Chardon, of the above host which occurs near Arecibo, but none of the rust could be found. It is not unlikely that the rust will eventually be found to occur there where the host is abundant.

UROMYCES SALMEAE Arth. & Holw. Am. Jour. Bot. **5**: 445. 1918

This rust was collected on two occasions in Porto Rico on *Salmeae scandens* (L.) DC. According to Dr. Arthur, the species has been known previously only from the type collection in Guatemala on the same host.

FRED J. SEAVER

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